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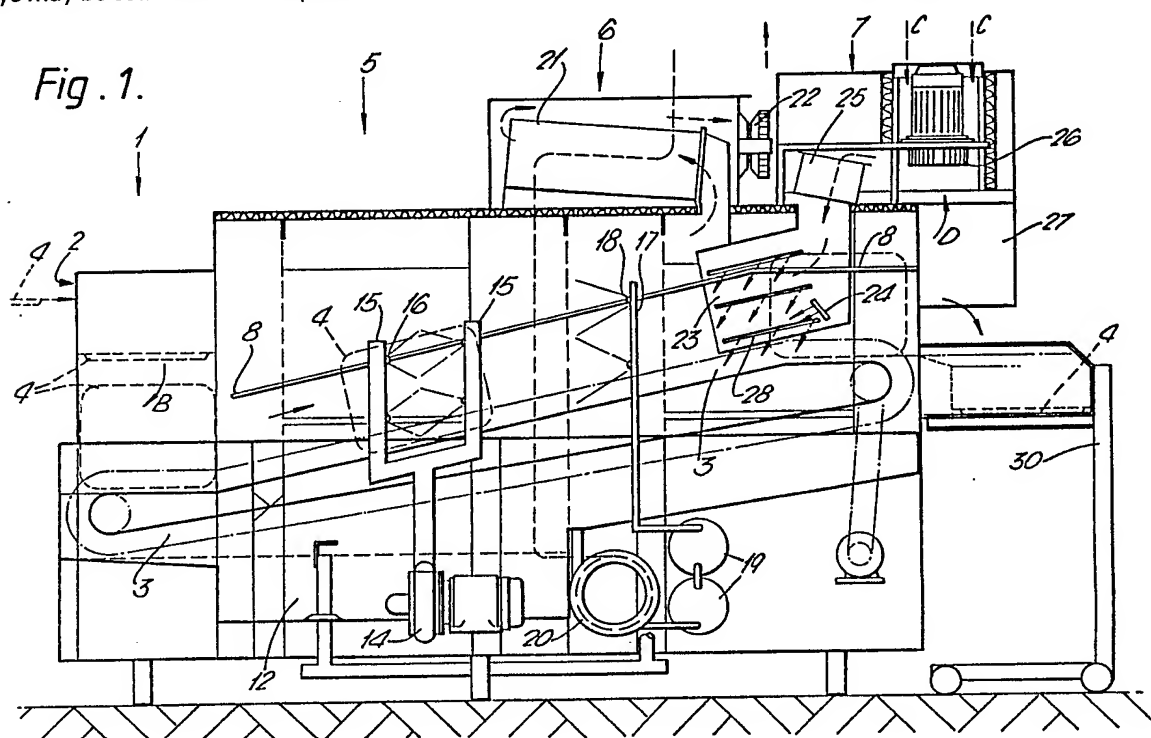
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(54) Machine for washing trays and dishes

(57) A machine for washing trays comprises an inlet section 1 into which trays 4 are introduced, a conveyor 3 for conveying the trays along an ascending path, a wash zone 5 in which the trays are washed by jets of wash liquid issuing from nozzles 18, and a rinse zone 6 in which the trays are rinsed by jets of liquid issuing from nozzles 16, a drying zone 7 in which the trays are dried by means of heated air. The latter may be produced by fan 26 blowing air through an electrical heating device 25. The wash and rinse liquids may also be heated electrically. The cleaned trays may be collected on a dispenser 30. The machine may also be used for washing dishes.



GB 2 155 772 A

Fig. 1.

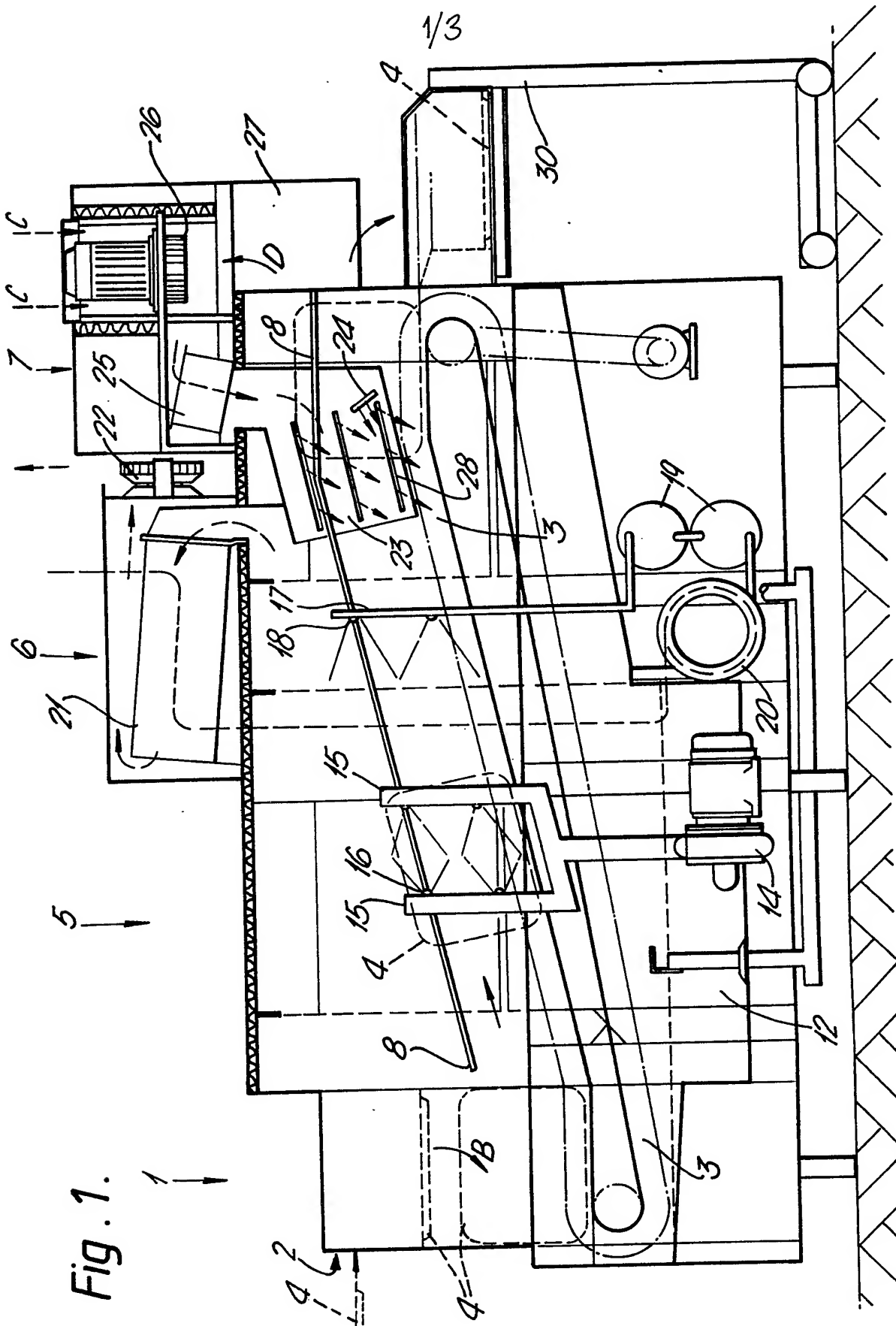
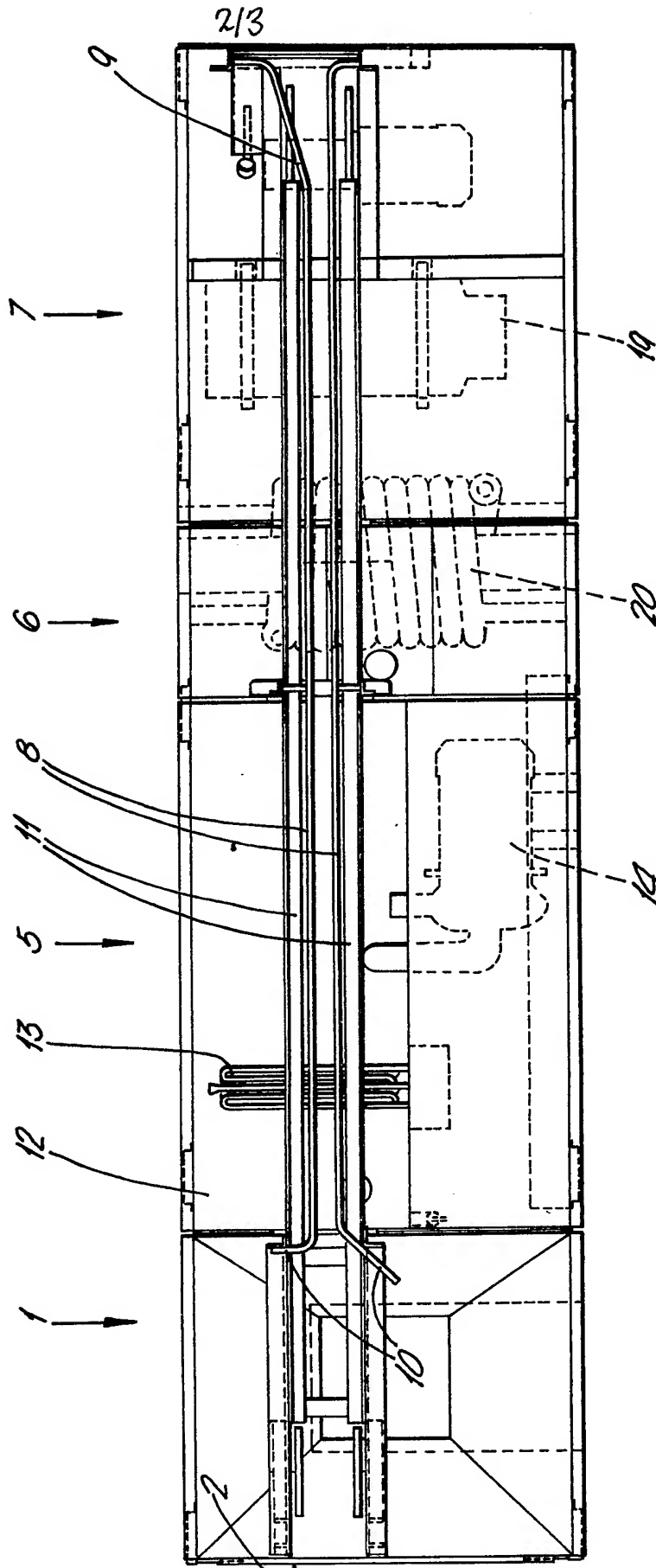


Fig. 2.



3/3

Fig. 3.

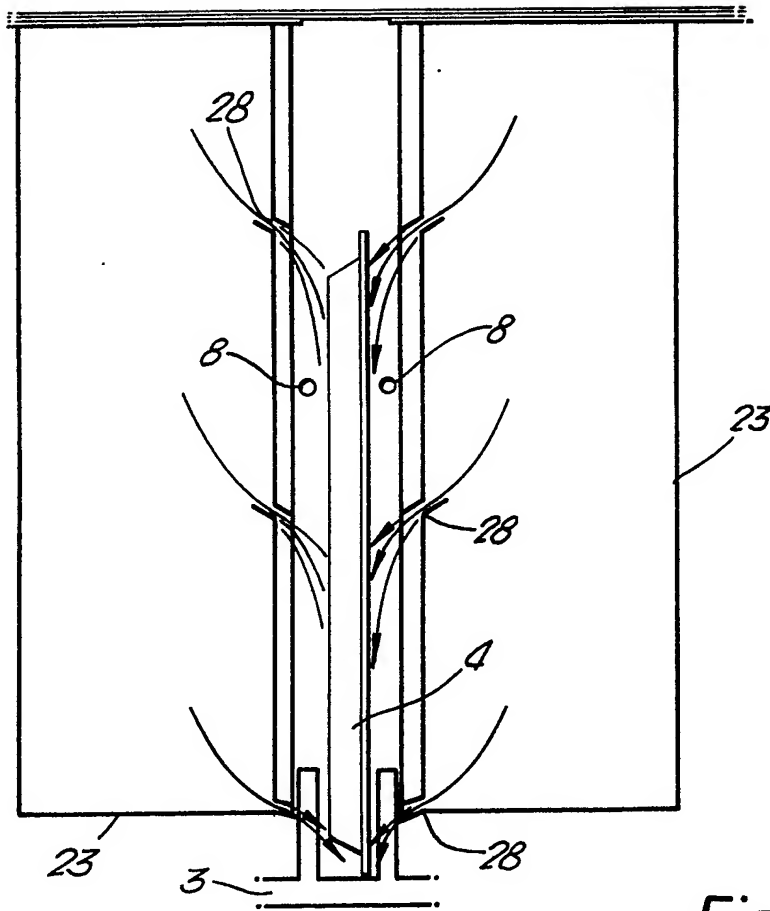


Fig. 4.

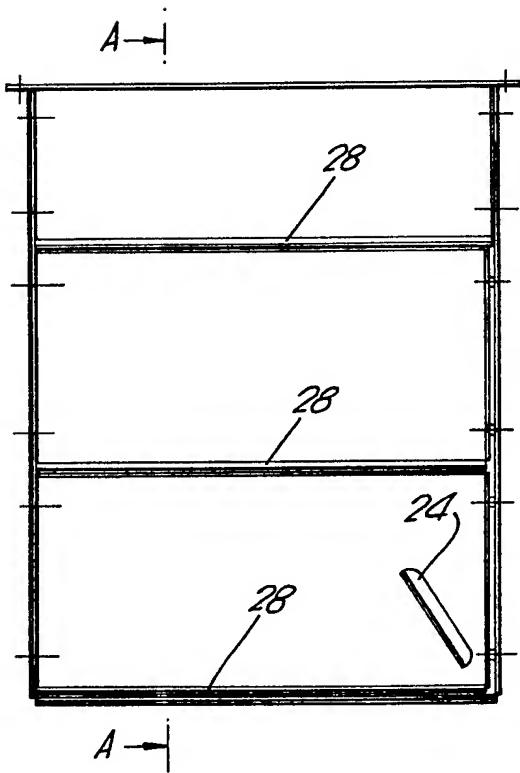
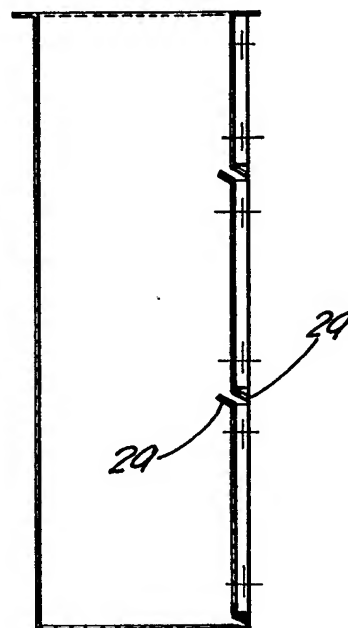


Fig. 5.



SPECIFICATION

A method and a machine for dishwashing

The present invention relates to a method of washing up articles and to a dishwashing machine for carrying out the method, the machine being adapted in a fully mechanized way to wash articles, preferably trays of plastic, which are fed one by one through the dishwashing machine.

For reasons of economy, the use of trays made of thermoplastic material has increased materially in larger kitchens and in the catering service. Such trays are inexpensive to manufacture and well suited for their purpose but suffer from the drawback of being unsuitable for washing in a conventional dishwashing machine of the belt type, since the residence time in the machine and the prevailing temperatures therein mean that the thermoplastic material will be heated to such an extent that it is damaged or deformed.

Nor is a conventional belt-type dishwashing machine very well suited for an entirely mechanical handling of the articles to be washed, since such a dishwashing machine requires that the articles to be washed are placed in baskets or in a belt provided with pockets which is thereafter run through the dishwashing machine. This means that the baskets or the belt must be filled and emptied by hand. At least the emptying operation must be carried out by the kitchen staff, which in many cases means a rather cumbersome extra working effort, if large quantities of trays are to be washed up.

If the washing operation should be carried out in a completely mechanized way, this means that the eating guest suitably himself must deliver his tray at the inlet opening of the dishwashing machine. Furthermore, in such a case it is also necessary that the washed and dried trays can be discharged in such a manner that they are automatically stacked, so that an entire stack can be taken care of by the kitchen staff and be conveyed in a so-called dispenser back to the place of use.

The object of the present invention thus is to provide a method of washing articles, preferably trays of thermoplastic material, the method being so conceived as to completely overcome the above-mentioned problems.

According to the invention, this object is achieved by a method in which the articles are fed by a conveyor and exposed at least to jets of washing liquid, rinsing water and drying air, the method being characterized in that the articles are fed one by one along the conveyor from a lower to a higher level.

By these measures, the eating guest can himself deliver his tray on a convenient level to a buffer magazine, from which the trays are thereafter fed down onto the inlet end of the conveyor, while the trays are discharged on a high level which is sufficient to allow stacking the trays after being discharged. Further, it is achieved by the piecewise feed of the trays that both sides of the trays can simultaneously be subjected to washing and drying and, also, that both the washing and the drying operation can be effected by means of jets of

washing liquid and drying air from a very short distance directly against the trays.

The method according to the invention is suitably also characterized in that the articles are guided in such positions along guides which are held fixed relative to the conveyor, that the general planes of the articles are substantially vertical and parallel to the direction in which they are fed.

Suitably, it is also contemplated according to the invention to discharge jets of washing liquid, rinsing water and drying air in directions forming an acute angle with the direction in which the articles are fed.

Another object of the invention is to provide a device for washing articles, preferably trays of thermoplastic material, which device is so conceived as to overcome the above-mentioned problems and, hence, to offer a possibility of a fully mechanized way of carrying out the washing operation, the entire procedure being carried out in such a manner that washing becomes extremely efficient and drying complete without it being necessary to heat the trays to such an extent that the material thereof is damaged.

According to the invention, this object is achieved by a device which comprises a conveyor for feeding the articles through the machine, nozzle devices connected to pump devices and adapted to direct jets of washing liquid and rinsing water against the articles, and blower means for drying the articles, the device being characterized in that the conveyor is arranged for directly feeding the articles one by one through the machine and has an inlet end which is located on a lower level than its outlet end.

In order to obtain a reliable conveyance of the articles in such positions that they can be efficiently subjected to the washing and drying processes while allowing reorientation of the articles it is suitably foreseen by the invention to dispose the conveyor below fixed guides between which the articles can slide with their general planes substantially vertical, said guides at the outlet end of the conveyor having guide surfaces for turning the objects into positions in which their general planes are substantially horizontal.

The device according to the invention is suitably further characterized in that the nozzle devices and the blower means are arranged on either side of the guides, preferably symmetrically and in the immediate vicinity of the path of travel of the articles.

In order, at such a high rate of feed of the articles through the dishwashing machine that the material of the articles will not be heated to critical temperature levels, yet to obtain a satisfactory drying of the articles, the invention contemplates according to a suitable aspect thereof to provide the blower means with slit-shaped orifices for directing curtain-shaped jets of drying air along the articles in directions obliquely from above and against the direction of travel of the articles.

The invention will now be described in greater detail hereinbelow with reference to the accompanying drawings, in which

Fig. 1 is a schematic side view of the device according to the invention, with certain parts,

primarily protective covers and the like, removed for the sake of clarity;

Fig. 2 is a similar view from the above illustrating the dishwashing machine the upper portion of which has been removed for greater clarity;

Fig. 3 is a vertical section through the drying zone of the dishwashing machine and illustrates the flow of drying air along a tray moving through the dishwashing machine;

Fig. 4 is a top plan view of a blower means according to Fig. 3, and

Fig. 5 is a section taken along A—A in Fig. 4.

In the following description of a preferred embodiment of the invention, this embodiment is particularly adapted to and designed for the washing-up of trays which preferably consist of thermoplastic material. However, the invention is readily applicable also to other types of articles, e.g. plates or the like, if so desired.

As appears from Fig. 1, the device of the invention comprises an inlet section 1 which, on the left-hand side in the figure has an inlet opening 2 for introducing the trays 4 to be washed. Below the inlet section 1, there is disposed a conveyor 3 which extends through the entire dishwashing machine and terminates at the right end thereof where the washed trays are discharged. The dishwashing machine further comprises in a per se known manner a washing zone 5, where detergent-containing water is flushed against the articles passing through the dishwashing machine. After the washing zone 5, the machine has a rinsing zone 6 where the articles are flushed with heated rinsing water so as to remove any detergent remaining on the articles. After the rinsing zone 6 in the direction of movement of the conveyor, there is provided a drying zone 7 in which the articles are exposed to jets of heated drying air for drying the articles.

The most essential difference between the device according to the invention and the mode of operation thereof and a conventional belt-type dishwashing machine resides in that the throughput time is considerably shorter, such that an entire washing cycle according to the invention will not take more than 1—4 seconds. Although the temperatures in the different zones are on conventional levels, i.e. at about 60°C in the washing zone, about 80°C in the rinsing zone and approximately the same temperature in the drying zone, the short throughput time for each separate article to be washed means that it will not be heated by far to the highest temperatures prevailing in the machine, which is otherwise normally the case in conventional belt-type dishwashing machines where the throughput time in the drying zone alone may be over one minute or more.

According to the invention, the conveyor 3 is a chain conveyor made of plastic and forming a channel with an approximately V-shaped or U-shaped bottom on which the trays are standing in substantially vertical or at least upright positions and along which the trays are fed one by one, often at a certain distance from each other. To safely guide the trays 4 so that they are maintained in safe upright positions and are not overthrown by

unsymmetric jets of washing liquid, rinsing water, drying air or the like, there are provided along the upper edges of the trays, guides 8 which are fixed in relation to the conveyor 3. At the forward outlet end of the conveyor, the guides 8 have guide surfaces 9 which serve to lay down or turn over the trays from the upright position on the conveyor to a horizontal position in which the trays can be stacked on each other immediately upon discharge.

According to the invention, the inlet section 1 is designed as a buffer magazine in which the trays are introduced in horizontal positions on top of each other so as to form a stack. Further, the inlet section is designed in such a manner that the lowermost tray in the stack will always be separated therefrom and swung about an axis which is longitudinally directed in the machine and, hence, is substantially parallel to the general direction of travel of the conveyor 3. This pivotment of the trays is illustrated in Fig. 1 by the arrow B. To assist in guiding such trays as may not have completed their pivotal movement in the inlet section, the guides 8 also have guide surfaces 10 at their inlet end.

The use of the buffer magazine in the inlet section 1 means that if the buffer magazine should have a reasonable capacity, the inlet end of the conveyor 3 must be located on a relatively low level above the floor to make it possible to manually supply trays to the stack in the buffer magazine. Furthermore, the need of stacking the trays discharged from the dishwashing machine, if such a stack should have a relatively large height, means that the outlet end of the conveyor 3 should be on a relatively high level. Thus, the conveyor must transport the trays from a lower supply level to a higher discharge level.

In order to obtain the inclination of the conveyor in the manner indicated above, the links of the conveyor run in guide rails 11, whereby the conveyor, although being designed as a chain conveyor, can have a completely linear run.

The use of the inclined conveyor with guide rails 11 involves a tendency of transfer of liquid, primarily water draining off the trays in the drying zone and water flushed in the rinsing zone, such that said water will descend along the conveyor and the guide rails 11 to the washing zone 5 where the washing liquid is diluted in an unsuitable way. To eliminate such problems, the guide rails 11 have been designed with a number of interruptions or openings (not shown in the drawings) preventing liquid from flowing down along the rails.

The upward slope of the conveyor 3 also entails on some occasions that there is a risk that the articles or trays being washed may slide on the conveyor, for instance under the action of too powerful jets of washing liquid or rinsing water. In order to ensure as far as possible that the conveyor will efficiently entrain the trays or the articles being washed, a high-friction rubber member is arranged in the bottom of the conveyor and optionally provided with ridges engaging the edges of the trays facing the conveyor. In one embodiment of the invention, this rubber member may be elongate and continuous and interlaced in the chain forming the conveyor, such that the rubber member will have

the shape of a closed loop of substantially the same length as the conveyor. In another alternative embodiment, each chain link in the conveyor may have its own friction member which serves the same purpose as the above-described rubber element.

If possible, the chain should be designed in such a manner that there are no actual drivers, i.e. means which by directly mechanically engaging the trays move them upwards along the conveyor, since in such a case, the operation of the inlet section 1 and the movements of the conveyor would have to be accurately synchronized to ensure that the trays fed from the inlet section 1 down onto the conveyor are always in a correct position in relation to the drivers.

The device according to the invention has in a per se known manner a collecting trough for receiving the liquid which is used during the washing operation. Thus, there is provided in the washing zone 5 a collecting trough 12 in which an electric heating device 13 is arranged, such that the washing solution admixed with detergent and present in the collecting trough can be maintained at a temperature of about 60°C. By means of a motor powered flushing pump washing liquid is drawn from the collecting trough 12 and placed under high pressure, whereupon it is led through pipings to a spraying line on either side of the conveyor 3. Each spraying line comprises at least two flushing pipes 15 which are vertical and provided with nozzles 16. The nozzles 16 are designed as so-called flat-jet nozzles, which means that they eject curtain-shaped jets. Further, the flushing pipes 15 and the nozzles 16 are arranged in such a manner that they direct the jets at an acute angle to the direction of travel of the trays 4 and such that the jets from the two pipes 15 are directed against each other to avoid an excessive effect on the article being flushed by the jets. The flushing pipes 15 are disposed symmetrically on both sides of the conveyor 3 and the guides 8 and are located as close as possible to the trays 4 travelling on the conveyor.

In the rinsing zone 6, there are provided flushing pipes 17 with nozzles 18. As in the case of the washing zone, the flushing pipes are here also arranged pairwise on either side of the conveyor as close to it as possible. In this case, too, the nozzles 18 are directed in such a manner that the jets make an acute angle and sweep along the trays 4 travelling on the conveyor.

The rinsing water from the nozzles 18 has a suitable temperature of about 85°C and has been given such a high temperature by being conducted through electric through-flow heaters 19 and a heat exchanger 20. The heat which is supplied to the rinsing water in the heat exchanger 20 is derived from a condensing battery 21 which, in turn, takes up thermal energy from hot moist air which is sucked off from the interior of the machine, primarily the rinsing zone 6, and which is propelled by a fan 22 from which it is exhausted in the cooled state.

In the drying zone 7, there are provided on either side of the conveyor 3 and the guides 8 blower means 23 which may be described as box-shaped

devices with slit-shaped nozzles. These two blower means are designed to eject high-speed curtain-shaped jets of heated air which are directed obliquely from above and against the direction of movement of the conveyor at an acute angle to and alongside the trays fed on the conveyor. In this manner, these curtain-shaped heated jets of air will "peel off" such water as adheres to the trays so as to move it towards the lower trailing corner of the tray as seen in the direction of travel, from where it will leave the tray. To this end, each blower means has a special nozzle 24, which is directed towards the lower trailing corner of the tray as seen in the direction of travel.

The air blown from the blower means against the trays 4 is heated to a temperature of the order of 80—90°C. Such heating of the air is carried out in an electric heating battery 25 through which air is driven by a fan 26. The air which the fan 26 feeds through the heating battery consists of air coming from the ambient atmosphere as indicated by the arrows C, and of air recirculated from the drying zone as indicated by the arrow D. In order to improve the recirculation of heated air from the drying zone, there is provided a collecting hood 27 establishing flow communication between the outlet end of the machine and the fan.

The two blower means 23 which are used for blowing the trays 4 in the drying zone 7 dry are shown more clearly in Figs. 3—5. Fig. 3 being a view in the direction of travel of the conveyor. From this figure, it clearly appears that the two blower means 23 are disposed immediately adjacent the guides 8, whereby to ensure that the jets of air directed against the tray 4 will not have time to diffuse to any major extent before they hit the tray. Further, it appears that the jets of air, illustrated by arrows in the figure, are directed obliquely downwardly and along the plane of the tray. In order to obtain such a flow pattern for the air, use is made of elongate slit-shaped nozzles 28 which are defined by two guide plates 29. Further, as indicated above there is provided on each blower means a special nozzle 24 which is directed towards the lower rear corner of the trays as seen in the direction of travel, so as to separate any remaining drops of water therefrom. This nozzle, too, is slit-shaped and therefore directs a curtain-shaped flow of air against said portion of the tray.

The device according to the invention operates in the following way. The trays 4 which are to be washed up are preferably delivered by the eating guest himself through the inlet opening 2 of the inlet section 1 in a horizontal position and are stacked on support means disposed in the inlet section, so as to form a buffer store. At regular time intervals, the lowermost tray is separated from the stack and is swung about a horizontal axis, such that the tray will be in an upright position when it is fed down onto the conveyor 3. Since the speed of travel of the conveyor is continuously adjustable, the delivery rate from the stack of trays is of course also adjustable. Immediately after or in connection with the downward feed of the trays onto the conveyor 3, the upper portions of the trays will be engaged by

the two guides 8, and the guide surfaces 10 may then assist in aligning such trays as may not be in the exactly correct position from the very start. The trays will then be advanced by means of the conveyor to the right and upwards in Fig. 1 by frictional interaction between the lower edge of the

In the washing zone 5, the tray is simultaneously flushed on both sides by means of jets directed at an acute angle to the tray and pairwise directed against each other so as to avoid an excessive force exertion on the tray. The tray is thereafter transferred by the conveyor from the washing zone 5 to the rinsing zone 6 where flushing is effected by means of curtain-shaped jets of rinsing water. After rinsing, the tray is fed into the drying zone 7 where it passes between two blower means 23 which direct curtain-shaped jets of hot air obliquely against and along the tray simultaneously on both sides thereof. Any water adhering to the tray will then be "peeled off" and transferred to the lower trailing corner of the tray where a separate nozzle 24 ejects a powerful jet of air for removing this residual water. From the outlet portion of the drying zone, the tray is turned over by cooperating with guide surfaces 9 on the guides 8, so that the tray will again assume a horizontal position when it is discharged onto a so-called dispenser 30, which is designed in such a manner that the stack of trays which is placed on the dispenser will cause the supporting elements thereof gradually to descend such that the upper side of the stack will always be on the same level and on a correct level in relation to the discharge of the dishwashing machine.

Although the invention has been described above by way of an embodiment devised especially for washing trays, it goes without saying that the invention may easily be modified so as to allow washing articles of other shapes. Thus, the invention may for instance readily be modified for washing plates or the like simply by adapting the conveyor 3, the guides 8, the inlet section 1 and the outlet section to the dimensions and shapes of the articles to be washed.

As an example of a modification which may become necessary if the machine should be used for washing round articles, it may be mentioned that the conveyor 3 will probably have to be provided with actual drivers, which, in turn, means that the operation of the inlet 1 must be accurately synchronized with the operation of the conveyor 3. Optionally, the friction between the conveyor 3 and the plates can be enhanced if the conveyor is equipped with friction-increasing rubber bodies or the like ensuring a powerful frictional engagement by mechanically clamping a narrow edge portion of the plate. The required clamping force is achieved by the short distance the plate is allowed to drop from the inlet section 1 down onto the conveyor 3.

Furthermore, the blower means 23 can be modified by also being equipped with vertical slit-shaped nozzles, at least at the left hand edge in fig. 4 but optionally also at the right-hand edge. These

vertical nozzles should direct the ejected jets of air obliquely against the direction of travel. In a further alternative, the nozzles 28 can be obliquely directed and approximately parallel to the nozzles 24.

CLAIMS

1. A method of washing articles, preferably trays, which are fed by a conveyor and at least subjected to jets of washing liquid, rinsing water and drying air, characterized in that the articles are fed one by one along the conveyor from a lower to a higher level.

2. A method as claimed in claim 1, characterized in that the articles are guided in such positions along guides which are maintained fixed relative to the conveyor, that the general planes of the articles are substantially vertical and parallel to the direction in which they are fed.

3. A method as claimed in claim 1 or 2, characterized in that the jets of washing liquid, rinsing water and drying air are ejected in directions which make an acute angle with the direction in which the articles are fed.

4. A method as claimed in claim 2 or 3, characterized in that the articles are introduced in the machine with their general planes substantially horizontal and are optionally intermediately stored in this position, that they are swung about a first axis which is substantially parallel to the general direction of feed during the washing operation, and that they are again swung about an axis substantially parallel to said first axis when being discharged after drying.

5. A device for washing articles, preferably trays, said device comprising a conveyor (3) for feeding the articles through the machine, nozzle devices (15—18) connected to pump devices (14) and adapted to direct jets of washing liquid and rinsing water against the articles and blower means (23) for drying the articles, characterized in that the conveyor (3) is designed for directly feeding the articles one by one through the machine, and that it has an inlet end located on a lower level than its outlet end.

6. Device as claimed in claim 5, characterized in that the conveyor (3) is disposed below fixed guides (8) between which the articles (4) can slide with their general planes approximately vertical, the guides at the outlet end of the conveyor having guide surfaces (9) for turning over the articles to a position in which their general planes are substantially horizontal.

7. Device as claimed in claim 5 or 6, characterized in that the nozzle devices (15—18) and the blower means (23) are arranged on either side of the guides (8), preferably symmetrically and in the immediate vicinity of the path of travel of the articles (4).

8. Device as claimed in claim 7, characterized in that the blower means (23) have slit-shaped air orifices (28) for directing curtain-shaped jet of drying air along the articles (4) in directions obliquely from above and against the direction of travel of the articles.

9. A method of washing articles, substantially as

herienbefore described with reference to and as
shown in the accompanying drawings.

10. A device for washing articles, substantially as

hereinbefore described with reference to and as
5 shown in the accompanying drawings.

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DERWENT-WEEK: 198834

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TITLE: Tray and dish washing method by feeding trays along conveyor to washing and rinsing zones, and finally to zone where they are dried by heated air

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1984SE-001649 (March 24, 1984)

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GB 2155772 A	October 2, 1985	EN
SE 8401649 A	September 25, 1985	SV
FI 8500770 A	September 25, 1985	FI
SE 454233 B	April 18, 1988	SV
GB 2155772 B	May 25, 1988	EN
SE 455757 B	August 8, 1988	SV

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INT-CL-CURRENT:

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CIPS	A47L15/48 20060101

ABSTRACTED-PUB-NO: GB 2155772 A**BASIC-ABSTRACT:**

The machine includes an inlet section (1) into which trays (4) are introduced. The trays are conveyed along an ascending path to a zone 5 in which the trays are washed by jets of liquid issuing via nozzles (16). A second zone (6) rinses the trays using jets of liquid issuing from a second number of nozzles (18). Finally the trays are dried using heated air. The heating may be produced by a fan (26) blowing air through an electrical heating device (25).

The wash and rinse liquids may also be heated electrically. The cleaned trays may be collected on a dispenser (30).

TITLE-TERMS: TRAY DISH WASHING METHOD FEED
CONVEYOR RINSE ZONE FINAL DRY HEAT
AIR

DERWENT-CLASS: P28 X27

EPI-CODES: X27-D01B;